



Rebound of shelf water salinity in the Ross Sea

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Antarctic Bottom Water (AABW) supplies the lower limb of the global overturning circulation and ventilates the global ocean abyssal layers. In recent decades, AABW has warmed, freshened and reduced in volume, altering the deep ocean stratification and contributing to changes in ocean heat content and sea level. The Ross Sea is the second largest source of AABW and Ross Sea Bottom Water (RSBW) has experienced the largest freshening trends of any bottom water variety. Here we use 23 years of summer salinity measurements to document temporal variability in the salinity of the Ross Sea High Salinity Shelf Water (HSSW), precursor to RSBW. HSSW salinity decreased between 1995 and 2014, consistent with rapid freshening observed between 1958 and 2008. However, HSSW salinity rebounded sharply after 2014, with values in 2018 similar to those observed in the mid-1990s. In addition to the multi-decadal trend, time series from five locations in the Ross Sea show near-synchronous fluctuations in salinity. Neither the long-term trend nor the interannual fluctuations can be explained by local changes in Terra Nova Bay, where the most saline HSSW is produced, suggesting upstream preconditioning influences the salinity of dense water formed on the shelf.